## DETAILED ACTION

### *Continued Examination Under 37 CFR 1.114*

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on October 19th, 2011 has been entered.

### *Claim Rejections - 35 USC § 103*

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1, 3-6, 14, and 19-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Magnitski et al. (US 6,522,616) in view of Glushko et al. (US 6,291,132) and further in view of Bawendi et al. (US 6,774,361).

Regarding claim 1:

Magnitski discloses:

A method of storing data comprising:

distributing materials in a plurality of distinct data pit locations on a data storage medium (column 2, lines 50-65; column 3, line 58 to column 4, line 5),

the materials providing two or more different colors (column 3, line 58 to column 4, line 5),

wherein the plurality of distinct data pit locations different from each other for at least one of said two or more different colors and represent different states, each state being defined by two or more bits corresponding to the presence or absence of said two more different colors (column 4, lines 1-10; Fig. 5);

exciting said colors with said materials at each location by making them fluoresce (column 3, lines 35-45);

measuring said fluorescence of said materials at each distinct location to identify presence and absence of each of said two more different colors (column 3, lines 35 to 60),

wherein a calculation of a number of said distinct data pit locations is based on a number of said two or more different colors to reduce a space occupied by said data pit locations in the data storage medium disk (this follows from the disclosure that the data density is higher with more colors, as in column 3, line 58 to column 4, line 2).

Magnitski does not disclose:

(A) wherein the distinct data pit locations are "on a rotating data storage medium disk."

(B) wherein said materials are:

"a plurality of nanometer beads filled with nanometer sized particles,

"the nanometer sized particles providing two or more different colors to the nanometer beads."

Regarding (A):

Magnitski's data storage medium is a card, not a rotating disk.

Glushko discloses that it is possible to implement a fluorescent data storage medium as a card or rotating disk, among other possibilities (column 7, lines 25-35).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to include in Magnitski wherein the data storage medium is a rotating data storage medium disk, as taught by Glushko.

The rationale is as follows:

Glushko and Magnitski are directed to the same field of art (i.e., optical recording using fluorescent materials).

Magnitski differs from the claimed invention because it discloses a card rather than a rotating disc.

Glushko teaches that a rotating disc is a known alternative to a card, and that the differences between the two are well known (e.g., column 8, lines 20-30).

Therefore one of ordinary skill could have substituted this known alternative form for the card taught by Magnitski, and the results of the substitution would have been predictable.

Regarding (B):

Bawendi discloses materials that are:

a plurality of nanometer beads filled with nanometer sized particles (column 14, lines 15-50),

the nanometer sized particles providing two or more different colors to the nanometer beads (column 6, lines 25-65).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to include in Magnitski wherein the fluorescent materials are a plurality of nanometer beads filled with nanometer sized particles, the nanometer sized particles providing two or more different colors to the nanometer beads, as taught by Bawendi.

The rationale is as follows:

Magnitski and Bawendi (and Glushko) are directed to the same field of art (information storage using fluorescent materials).

Magnitski uses fluorescent dyes to record information (e.g., column 5, lines 40-50).

Bawendi specifically discusses using fluorescent dyes to store information (column 3, lines 5-15) and discloses that quantum dots are superior (column 3, lines 5-40).

One of ordinary skill could have combined this known improvement, quantum dots, with the disclosure of Magnitski, and the results would have been predictable.

Regarding claim 3:

Magnitski in view of Glushko, and further in view of Bawendi, discloses:

wherein said nanometer sized particles are nanometer sized fluorescent particles (taught by Bawendi as discussed above).

Regarding claim 4:

Magnitski in view of Glushko, and further in view of Bawendi, discloses:

wherein said nanometer sized particles comprise quantum dots (taught by Bawendi as discussed above).

Regarding claim 5:

Magnitski in view of Glushko, and further in view of Bawendi, discloses:

wherein said quantum dots are made up of red, blue and green color (Magnitski's fluorescent materials are these colors, as per column 3, line 65 to column 4, line 5, so in the combination it follows to use quantum dots of these colors).

Regarding claim 6:

Magnitski in view of Glushko, and further in view of Bawendi, discloses:

wherein said quantum dots are made up of a plurality of shades of a color (gray levels, as per Magnitski column 4, lines 1-10, are a plurality of shades of a color, and Magnitski discloses combining gray level and colors).

Regarding claim 14:

Magnitski in view of Glushko, and further in view of Bawendi, discloses:

wherein the beads placed in the same data pit location are further colored with different shades of a color (gray levels, as per Magnitski column 4, lines 1-10, are a plurality of shades of a color, and Magnitski discloses combining gray level and colors).

Regarding claim 19:

Magnitski in view of Glushko, and further in view of Bawendi, discloses a method as discussed above.

Magnitski in view of Glushko, and further in view of Bawendi discloses wherein the two or more different colors are red, green and blue as discussed above.

Magnitski in view of Glushko, and further in view of Bawendi, does not explicitly disclose:

wherein red is the most significant bit followed by blue and green is the least.

Nonetheless this would have been obvious to one of ordinary skill in the art at the time of the invention.

The rationale is as follows:

Of the three, one has to be the most significant bit, one the middle, and one the least.

There's a finite number of identified, predictable potential solutions to this problem.

One of ordinary skill could easily have pursued the known potential solutions with a reasonable expectation of success.

Furthermore, it makes no difference to the operation of the apparatus which of the three is the most, middle, or least significant bit. One could substitute the particular bit order claimed by applicant with any other and it would operate no differently.

Regarding claim 20:

All elements positively recited have already been identified with respect to earlier rejections (for the "different shades," see claims 6, 14). No further elaboration is necessary.

Regarding claim 21:

Magnitski in view of Glushko, and further in view of Bawendi, discloses:

wherein the number of said distinct data pit locations is N/M, where N is a number of bits to be stored and M is the number of said different colors (follows from Magnitski column 3, line 58 to column 4, line 2: the actual equation is not disclosed but is the trivial result of the increased density discussed).

Regarding claim 22:

Magnitski in view of Glushko, and further in view of Bawendi, discloses:

wherein the number of said distinct data pit locations is $N/L^M$, where N is a number of bits to be stored, M is the number of said different colors and L is a number of different shades of each different color (follows from Magnitski column 1, lines 1-10; Magnitski doesn't explicitly show the equation but it follows form the discussion -- not that Magnitski gives a specific example where L is 20 and M is 5 and the result disclosed (about three bytes) is the result of the claimed equation).

Regarding claim 23:

Magnitski in view of Glushko, and further in view of Bawendi, discloses:

wherein the nanometer sized particles of a single pit location are simultaneously illuminated by a single laser source within a focused spot size (Magnitski column 6, lines 50-60; where Magnitski earlier discloses that a laser can be a light source as per, e.g., column 3, lines 35-45).

4. Claims 10 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Magnitski in view of Glushko, and further in view of Bawendi, as applied to claim 1 above, and further in view of Metz (US 5,166,813).

Regarding claim 10:

Magnitski in view of Glushko, and further in view of Bawendi, discloses a method for storing data as discussed above in the rejection of claim 1.

Magnitski in view of Glushko, and further in view of Bawendi, does not disclose "wherein a HSMF is used for dispersing collimated fluorescent light on a spectrally sensitive component."

Metz discloses that when detecting fluorescence, a holographic multi-spectral filter is used for dispersing collimated fluorescent light on a spectrally sensitive component (the abstract discloses the use of a holographic filter; Fig. 1 depicts the light impacting the spectrally sensitive component; column 12, lines 40-50 discloses that the hologram can be multi-spectral: that is, it transmits more than one wavelength). Metz discloses that a holographic filter is more efficient (column 13, lines 1-15).

It would have been obvious to one of ordinary skill at the time of the invention to include in Magnitski in view of Glushko, and further in view of Bawendi, a holographic multi-spectral filter as taught by Metz.

The combination would have been predictable to one of ordinary skill in the art; the motivation would have been to be more efficient.

Regarding claim 24:

Magnitski in view of Glushko, and further in view of Bawendi, and further in view of Metz discloses:

wherein the different colors of each bead of nanometer sized particles are spectrally separated before reaching a detector (this is what a HSMF does).

5. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Magnitski in view of Glushko, and further in view of Bawendi, as applied to claim 1 above, and further in view of Wenzel et al. ("Shaping nanoparticles and their optical spectra with photons," Applied Physics B 69 513-517; disclosed in IDS).

Regarding claim 11:

Magnitski in view of Glushko, and further in view of Bawendi, discloses a method of storing data as discussed above.

Magnitski in view of Glushko, and further in view of Bawendi, does not disclose wherein:

"said plurality of nanometer beads are distributed in said plurality of distinct data pit locations using laser-induced technology at each of said plurality of data pit locations."

Wenzel discloses:

fabricating nanometer beads using laser-induced technology (e.g., "Conclusions," on page 516).

Therefore it would have been obvious to one of ordinary skill in the art to include in Magnitski in view of Glushko, and further in view of Bawendi, wherein said plurality of nanometer beads are distributed in said plurality of distinct data pit locations using laser-induced technology at each of said plurality of data pit locations.

The rationale is as follows:

Magnitski in view of Glushko, and further in view of Bawendi, relies upon placing nanometer beads in a plurality of distinct data pit locations.

Wenzel discloses a known method of fabricating said beads.

One of ordinary skill could have used this known method in Magnitski in view of Glushko, and further in view of Bawendi, and achieved predictable results.

6. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Magnitski in view of Glushko, and further in view of Bawendi, as applied to claim 1 above, and further in view of Fuller et al. ("Ink-Jet Printed Nanoparticle Microelectromechanical Systems," Journal of Microelectromechanical Systems, Vol. 11, No. 1, February 2002, disclosed in IDS).

Regarding claim 18:

Magnitski in view of Glushko, and further in view of Bawendi, discloses a method as discussed above.

Magnitski in view of Glushko, and further in view of Bawendi, does not disclose wherein:

said plurality of nanometer beads are distributed in said distinct data pit locations using inkjet technology at each of said plurality of data pit locations.

Fuller discloses:

wherein nanometer beads are placed using inkjet technology (page 54: last two paragraphs).

It would have been obvious to one of ordinary skill in the art to include in Magnitski in view of Glushko, and further in view of Bawendi, wherein said plurality of nanometer beads are distributed in said distinct data pit locations using inkjet technology at each of said plurality of data pit locations.

The rationale is as follows:

Fuller demonstrates that inkjet technology is a known method for depositing nanometer beads. Fuller discloses that is advantageous (page 54).

One of ordinary skill could have combined the teaching of Fuller with that of Magnitski in view of Glushko, and further in view of Bawendi and achieved predictable results.

7. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Glushko in view of Bawendi.

Regarding claim 20:

Glushko discloses:

A method of storing data comprising:

distributing materials in a plurality of distinct data pit locations on a rotating data storage medium disk (column 12, lines 35-50),

the materials providing two or more different shades of a color (column 13, line 60 to column 14, line 15: different concentrations will be different shades),

wherein the plurality of distinct data pit locations differ from each other for at least one of said two or more different shades and represent different states (column 14, lines 5-15),

each state being defined by two or more bits corresponding to the presence or absence of anyone of said two more different shades (column 14, lines 5-15);

exciting the two or more different shades of said color within said materials by making them fluorescent (column 12, line 50 to column 13, line 5);

measuring said fluorescence of said materials at each distinct location to identify presence and absence of each of said two or more different shades (column 13, line 45-65),

wherein a number of said distinct data pit locations is related to a number of said two or more different shades ().

Glushko does not disclose:

wherein said materials are:

"a plurality of nanometer beads filled with nanometer sized particles,

"the nanometer sized particles providing two or more different shades of a color to the nanometer beads."

Bawendi discloses materials that are:

a plurality of nanometer beads filled with nanometer sized particles (column 14, lines 15-50),

the nanometer sized particles providing two or more different shades of a color to the nanometer beads (column 6, lines 25-65: different discrete emissions could be different colors or different shades of one color).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to include in Glushko wherein the fluorescent materials are a plurality of nanometer beads filled with nanometer sized particles, the nanometer sized particles providing two or more different colors to the nanometer beads, as taught by Bawendi.

The rationale is as follows:

Glushko and Bawendi are directed to the same field of art (information storage using fluorescent materials).

Glushko uses fluorescent dyes to record information.

Bawendi specifically discusses using fluorescent dyes to store information (column 3, lines 5-15) and discloses that quantum dots are superior (column 3, lines 5-40).

One of ordinary skill could have combined this known improvement, quantum dots, with the disclosure of Glushko, and the results would have been predictable.

***Response to Arguments***

8. Applicant's arguments filed October 19$^{th}$, 2011 have been fully considered but they are not persuasive.

Applicant numbered their arguments. For ease of understanding applicant's numbering system will be followed in the response.

However, before that, a brief overview of what appears to be applicant's main point will be discussed.

Applicant's arguments are largely directed to their new language directed to "a calculation...to reduce a space occupied by said data pit locations."

To support the amended language, applicant refers to page 9 of their specification, where it states that the 72,000 bits required for their example needs 72,000 locations in a current disk scheme, but only 24,000 locations in theirs.

All this is saying is that applicant's invention has a higher information density than a current scheme. It can store the same amount of data in 1/3$^{rd}$ as much space (in that example).

Note, though, that applicant isn't actually disclosing having a smaller recording medium or only using part of said medium. Nothing is actually physically reduced in size in applicant's invention. Applicant is just storing more information per area. Whether you want to call that increasing the information density or reducing the space occupied by the data locations, it is the same thing.

And it is exactly what Magnitski discloses. Magnitski teaches that by adding gray codes or colors you can increase the information density. Increased density means it takes less area to store the same amount of information, exactly what applicant discloses.

Now on to applicant's specific arguments:

(2.1) Here applicant has just listed the rejections.

(2.2) Applicant's first actual argument (starting on page 6) is that Magnitski "only discloses a combination of colors and gray levels within one pit location without any comparison among pit locations."

It's a bit difficult to understand what applicant means by this. It appears that applicant is arguing that Magnitski doesn't disclose that the colors differ between pit locations. However, if they didn't, Magnitski couldn't achieve the disclosed data density. If every pit had the same number of colors and levels than every pit would be the same and no information would be conveyed.

Applicant then goes on to say that in Magnitski "information density is only strictly based on the size of the pits (as emphasized above) and on the number of colors and shades in a pit, i.e. the number of colors and shades that can be housed in the pit."

That would appear be to be the same as in applicant's invention.

(2.3) In applicant's second argument (page 7) they disagree with an earlier comment of the Examiner about information density.

Again this argument is a bit difficult to understand. As best it can be understood, applicant appears to be arguing that by having more colors they require less space for data pit locations.

This is the same thing as saying that by having more colors, you can store information at a higher information density. Higher density means either storing more information in the space space, or the same amount of information in a smaller space. Magnitski discloses that there is a higher density with more colors and therefore teaches this element.

(2.4) Applicant again (starting on page 7) applicant argues about the information density. Here they argue that since Magnitski discloses that the information density is defined by the size of the pits, Magnitski doesn't disclose the claim language.

Applicant has completely misunderstood Magnitski. Magnitski does disclose that the size of the pits limits the information density, but then goes on to say that by adding gray level codes or colors, this density can be increased.

Applicant then argues that nanometer sized particles provides a further reduction and that Magnitski doesn't disclose this. However, these particles are taught by Bawendi as discussed above.

Applicant next argues Magnitski doesn't disclose a reduction in the space occupied by said data pit locations.

Again, when the information density increases, the number of data pits required to convey the same amount of information goes down. Magnitski discloses the increased information density and therefore conveys this point.

From here, applicant simply repeats their earlier arguments. As they have been thoroughly discussed, a detailed discussion of the rest of applicant's points is not necessary.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to CHRISTOPHER R. LAMB whose telephone number is (571)272-5264. The examiner can normally be reached on 9:00 AM to 5:30 PM Monday to Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Joseph Feild can be reached on (571) 272-4090. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/CHRISTOPHER R LAMB/
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